UCL Université catholique de Louvain

LMECA2640

2014-2015

Mechanics of composite materials.

5.0 credits	30.0 h + 30.0 h	2q

Teacher(s) :	Doghri Issam ; Lani Frédéric ;
Language :	Français
Place of the course	Louvain-la-Neuve
Inline resources:	> http://icampus.uclouvain.be/claroline/course/index.php?cid=LMECA2640
Prerequisites :	A course on Theory of Elasticity or Continuum Mechanics.
Main themes :	Composite materials, especially fiber-reinforced ones, are increasingly used in numerous industrial sectors (e.g., aerospace, automotive, sporting equipment) where the technological advances require combined properties that no classical homogeneous material has. The objective of this course is to introduce the students to the methods of analysis and computation which enable the design of structures or products made of composite materials. This is why the course will develop micro-mechanically based approaches, anisotropic elasticity, the theory of laminates, etc.
Aims :	Introduce the students to the basic concepts of the mechanics of composite materials in order to enable them to design structures and products made of those advanced materials. *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods :	Examination : written or oral. Final grade: 50% examination and 50% mini-projects.
Teaching methods :	Mini-project 1 : solving a simple problem with analytical methods. Mini-project 2 : design of composite materials or structures using commercial software. Mini-project 3 : read and comment a scientific article.
Content :	Chap. 1 Composite materials: types, properties, applications, fibers, matrices, forming processes. Chap. 2 Micro-mechanics approaches (homogenization theories). Chap. 3 Anisotropic elasticity. Chap. 4 Behavior of a single layer (micro- and macro-mechanics). Chap. 5 Classical laminate theory: constitutive equations, strength criteria, simple computation methods, inter-laminar stresses and edge effects. Chap. 6 Bending, vibration and buckling of anisotropic laminated plates. Basic equations and energy methods (finite elements). Chap. 7 Hygro-thermo-elasticity. Chap. 8 Experimental methods for material properties measurement.
Cycle and year of study :	> Master [120] in Civil Engineering > Master [120] in Mechanical Engineering > Master [120] in Electro-mechanical Engineering > Master [120] in Chemical and Materials Engineering
Faculty or entity in charge:	MECA